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Light vehicles: Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption) and 103 (Replacement pollution control devices)

Proposal for a new Supplement to the 01 series of amendments to UN Regulation No. 101 (Emissions of M_1 and N_1 vehicles)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to clarify the rules related to the selection of driving modes for testing of Off-Vehicle Charging Hybrid Electric Vehicle (OVC-HEV) with a mode selection switch. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21 and Add.1, Cluster 3), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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I. Proposal

Annex 8, paragraph 3.1., amend to read:

"3.1. Two tests shall be performed under the f following conditions:

Condition A: Test shall be ~~carried out~~ st **started** with a fully charged electrical energy/power storage device.

Condition B: Test shall be ~~carried~~ ~~out~~ **started** with an electrical energy/power storage device in min inimum st ıte of charge (maximum discharge of capacity).

The profile of the State of Charge (S (SOC) of the electrical energy/power storage device during different stag ges of the Type I test is given in Appendix 1 to this annex."

Annex 8, paragraph 4.1., amend to read:

"4.1. Two tests shall be performed under the following conditions:

4.1.1. Condition A: Test shall be ~~carried out~~ **started** with a fully charged electrical energy/power storage device.

4.1.2. Condition B: Test shall be ~~carried out~~ st **started** with an electrical energy/power storage device in minimum state of cha harge (maximum discharge of capacity). **and carried out with an operating mode keeping the vehicle in charge-sustaining operating condition, that being an operating condition in which the energy/power stored in the energy/power storage device may fluctuate but, on average, is maintained at a neutral charging balance level while the vehicle is driven.**

4.1.3. In agreement with the responsible authority, the following operation modes shall not be considered for the purpose of testing:

- **Operating modes which are not limited to vehicle propulsion but which, in addition to vehicle propulsion, are charging the energy/power storage device, such as 'charge mode';**
- **Operating modes for vehicle maintenance, such as 'maintenance mode';**
- **Operating modes for special limited purposes and not intended for daily operation, such as 'mountain mode'.**

~~The operating mode switch shall be positioned according to the table below:~~

Hybrid modes / Battery state of charge	Pure electric Hybrid Switch in position	Pure fuel consuming Hybrid Switch in position	Pure electric Pure fuel consuming Hybrid Switch in position	Hybrid mode n1 … Hybrid mode nn Switch in position
Condition A Fully charged	Hybrid	Hybrid	Hybrid	Most electric hybrid mode**
Condition B Min. State of charge	Hybrid	Fuel consuming	Fuel Consuming	Most fuel consuming mode***

ce: sport, economic, urban, extra-urban position…

** Most electric hybrid mode

The hybrid mode which can be proven to have the highest electricity consumption of all selectable hybrid modes when tested in accordance with condition A, to be established based on information provided by the manufacturer and in agreement with the technical service.

*** Most fuel consuming mode

The hybrid mode which can be proven to have the highest fuel consumption of all selectable hybrid modes when tested in accordance with condition B, to be established based on information provided by the manufacturer and in agreement with the technical service.

4.1.4. **The operating mode shall be selected as described in paragraphs 4.1.4.1. to 4.1.4.2.2. inclusive.**

4.1.4.1. **Operating mode selection for Condition A**

4.1.4.1.1. **If there is a single operating mode under condition A that is always selected when the vehicle is switched on regardless of the operating mode selected when the vehicle was previously shut down, and which cannot be switched to another mode without an intentional action of the driver or be redefined, this single operating mode shall be selected.**

4.1.4.1.2. **If there is no single operating mode under condition A that is always selected when the vehicle is switched on, the most electric energy consuming mode shall be selected.**

4.1.4.2. **Operating mode selection for Condition B**

4.1.4.2.1. **If there is a single operating mode under condition B that is always selected when the vehicle is switched on regardless of the operating mode selected when the vehicle was previously shut down, and which cannot be switched to another mode without an intentional action of the driver or be redefined, this single operating mode shall be selected.**

4.1.4.2.2. **If there is no single operating mode under condition B that is always selected when the vehicle is switched on, the most fuel consuming mode shall be selected. "**

II. Justification

1. Background: Current legislative text for the mode selection of OVC-HEVs (before amendment)

(a) Annex 8, paragraphs 3.1. and 4.1. define condition A and condition B under which an OVC-HEV shall be tested according to this Regulation.

(b) In addition to the definition of condition A and condition B, Annex 8 paragraph 4 defines - in a table - the positioning of the operating mode switch for an OVC-HEV with an operating mode switch, means which operating mode has to be selected for condition A as well as for condition B.

2. Justification 1 for amendment: Current legislative text opens up room for interpretation

(a) Paragraphs 3.1. and 4.1. define the conditions and (in the case of an OVC-HEV with operating mode switch) the modes to be selected for condition A and condition B but nevertheless leave a lot of room for interpretation which could lead to physically unreasonable interpretations of the legislation.

E.g. condition B is defined as carrying out the test with an electric energy/power storage system device in minimum state of charge but is not excluding modes which only have the purpose of increasing the state of charge in addition to spend energy for the vehicle propulsion.

(b) The table under paragraph 4.1. offers specific mode set up vehicle configurations but there is not a clear definition of 'pure electric', 'pure fuel consuming', 'hybrid'. There is therefore the question of whether a 'pure electric' mode is still a pure electric mode when the combustion engine is turning on after kick-down of the accelerator pedal which only is done in case of an emergency or by overtaking a car.

3. Justification 2 for amendment: Current legislative text could lead to unreasonable mode selection for condition B

(a) The operating mode specified in the table under paragraph 4.1. leads, in the case of several hybrid modes, to an unreasonable mode selection according to the right hand column of the table.

(b) In the case that there is a mode which in addition to utilising the fuel energy for vehicle propulsion also uses the fuel energy for charging the electric power/energy storage device, this mode has to be selected.

(c) In the test result, this is reflected in a higher fuel consumption and CO_2 mass emission but on the other hand also in a lower electric consumption.

4. Justification 3 for amendment: Current legislative text is not reflecting the intention of the purpose of condition B

(a) The current text is not clear in case of the mode selection and in addition does not reflect the intention of the legislation concerning the purpose of condition B.

(b) Purpose of Condition B: Condition B shall reflect a charging balance neutral SOC balance which means that it should reflect only the energy used for vehicle propulsion.

(c) Not the purpose of Condition B: Condition B shall not reflect the energy stored in the energy/power storage device for a later use for vehicle propulsion. As such a later use is not reflected in the results, there is no justification to apply a mode which is charging the battery.

5. Proposed amendment:

(a) Legislative text from WLTP has been used as basis and reference for the amendment

(b) WLTP legislation already in force.

(c) Amendment reflects the intention for condition B testing in a robust and correct way.

(d) Modes for special and limited use special purposes as maintenance modes are being excluded.

(e) Amendment removes the table under paragraph 4.1. and replaces it with a clear mode selection guidance.